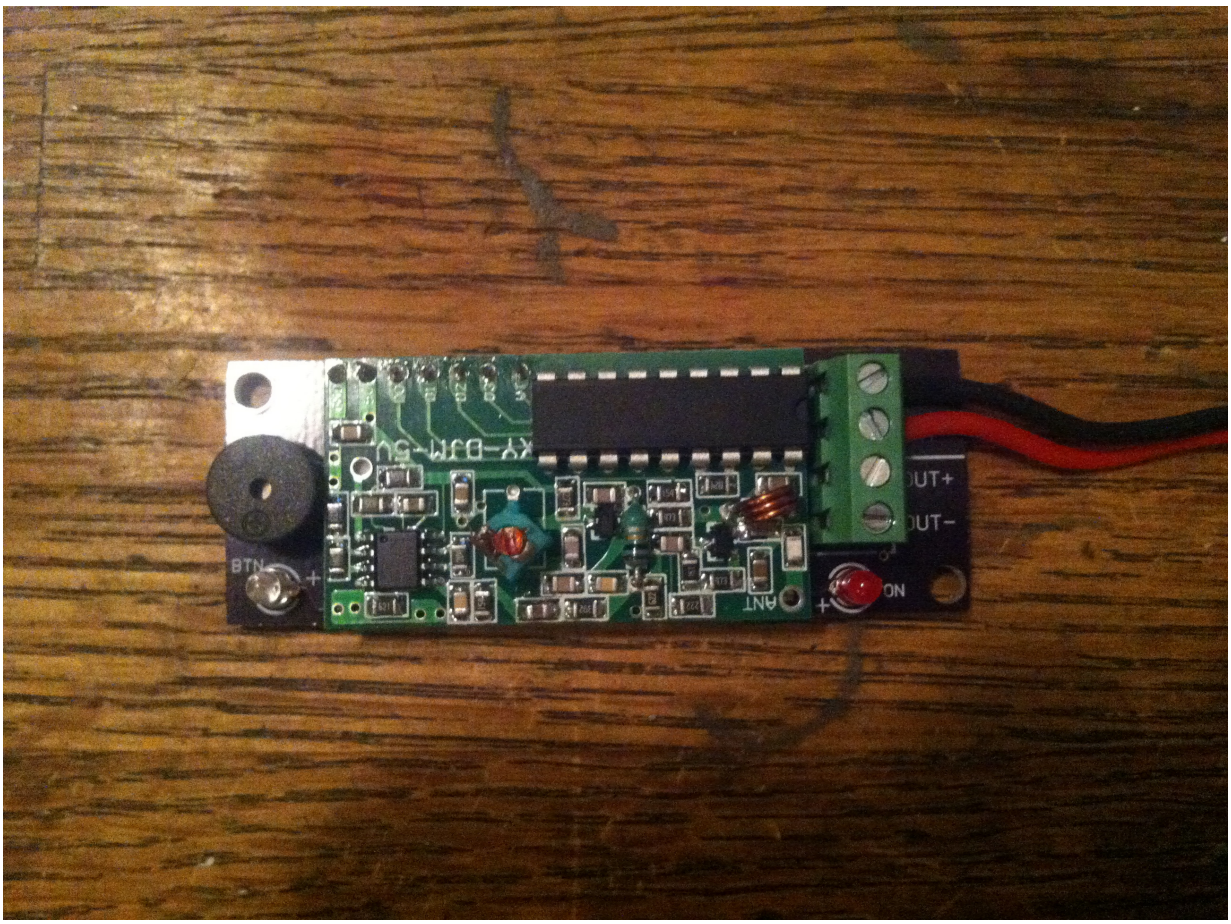
Eggtimer Remote Switch
Assembly and Users Manual

Rev A3



© 2015 Eggtimer Rocketry
All Rights Reserved

California Proposition 65 Warning

WARNING: This product contains chemicals (lead) known to the State of California to cause cancer and birth defects or reproductive harm.

This kit includes a special low-temperature ultra-fine leaded solder wire. Including the solder with the kit ensures that you will have solder that can be used to mount the surface-mount parts in the kit. Leaded solders have been used for over a century in electronic assembly, but you should take the following precautions when using it (or just about any chemical, for that matter):

- Do not eat or drink while using it
- Wash your hands after handling it
- Keep it in the protective bag when you're not using it

The MSDS can be found at

http://www.kester.com/download/245%20FluxCored%20Wire%20Lead%20Alloy%20SDS.pdf

Important Regulatory Information

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

It is intended to be used ONLY for educational and experimental use in Class II/III amateur High Power Rockets which are classified as aircraft by the Federal Aircraft Administration (CFR 14 §101.25), and which must by FAA and NFPA regulations be operated at least 1,500' away from any populated buildings. Although unlikely, this device may cause interference with consumer devices that run on the unlicensed 315 MHz band, and therefore must not be used in residential areas.

The Eggtimer Remote Switch uses a generic "PT2272" receiver module in the 315 MHz unlicensed "remote control" band. It is intended to be used only in the United States or other countries in which this band (or a subset of it) is not subject to licensing. As a hobby kit, designed for educational and experimental purposes, the Eggtimer Remote Switch is considered by the FCC to be "generally exempt" from authorization requirements. Nonetheless, we have made a good faith attempt to comply with all technical regulations, and you should too by building it **exactly** as per the instructions, and by using only the antenna that we recommend in the instructions.

Because the Remote Switch runs on an unlicensed band, there is no protection against interference from other sources; basically, you get what you get. We've done substantial testing and are confident that your Remote Switch is unlikely to be significantly affected by outside radio sources, but there's no guarantee.

If your Eggtimer Remote Switch causes interference in a residential setting, or with licensed radio systems (such as TV or ham radio), you **must** stop using it until you correct the problem. This is extremely unlikely given the small amount of power, and in particular the distance from any population that HPR rockets must be flown. Nevertheless, you need to be aware of this, and be willing to abide by the rules. These are the same rules that govern other non-licensed transmitters, such as cordless phones, WiFi and Bluetooth® devices, and garage door openers.

Important Links:

FCC Part 15 (governing unlicensed intentional and unintentional emitters)
http://www.ecfr.gov/cgi-bin/text-idx?SID=adb12f74b498e43ec453f7899d9df0fd&node=47:1.0.1.1.16&rgn=div5

FAA Regulations for Amateur Rocketry (Part 101)
http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&rgn=div5&view=text&node=14:2.0.1.3.15&idno=14

~~~~~~

Before You Start…

• Go to our web site at www.Eggtimerrocketry.com and download the latest Release Notes.

• Go to our web site at www.Eggtimerrocketry.com and download the latest Assembly/Users Guide..

• Read them thoroughly before starting… it will save you some grief later, we promise!

~~~~~~

Thanks for buying an Eggtimer Remote Switch! This is the answer to a problem that has bugged many of us electronic deployment users for a long time… How do you turn on (and off) the power to your electronics without opening up the AV bay? There have been all kinds of switches, both mechanical and electronic, used in hobby rocketry, but they all have involved having to reach into a hole in the AV bay or put something like a magnet very close to it in order to turn on the switch. More than once we've had to take a rocket off the rail because we couldn't reach the power switch inside the AV bay…

The Remote Switch uses a standard generic 315 MHz 4-button remote control to allow you to turn your electronics on and off from up to 100 feet away (dependent on the antenna, and the construction of your AV bay). You program your Switch with an 8-button code of your choice, there are over 65,000 possible combinations; the chance of somebody accidentally powering on or off your rocket's electronics is very slim. It can be fed from 6V-20V, and is capable of handling over 2A continuous or 8A in bursts (i.e. like the spike from an igniter). We've used it to light Estes igniters with a 2S LiPo in testing, so we're pretty confident that it can handle whatever your electronics can dish out. Typical draw is only about 15 mA, so any 2S LiPo worth buying is going to last the whole day and then some in your AV bay.

Like other Eggtimer Rocketry products, we sell it as a kit, to keep costs down and provide an outstanding value. This means that you have to do a little work, of course, but considering that most hobby rocketeers that would use our products have some degree of electronics expertise; this should not be much of an impediment. If you do not have any experience soldering kits such as this, we recommend that you ask around… chances are that somebody in your rocketry club would be more than happy to assist you for a small bribe (beverages work well!).

About Soldering Your Remote Switch…

Assembling your Remote Switch kit isn't that hard, but we recommend that you don't choose it as your first kit project. You must be able to solder small components using fine solder and get nice shiny solder joints. If you have never soldered before, you need to learn anyway, because if you are going to do rocketry electronics you're going to be doing some soldering. If you want to get into advanced projects like telemetry, you're probably going to be doing a lot of soldering. We recommend that you get a few small kits from Ramsey or SparkFun, put them together, and hone your skills on them first. There's a lot of fun stuff out there, so go for it!

The Remote Switch uses a number of Surface Mount Technology (SMT) parts, they are large by SMT standards, and are within the realm of being hand-solderable. In order to help make your assembly successful, we have included some very fine (.020"), very low temperature (about 180°C), no-residue solder. This is not the stuff that you get at Radio Shack… it's designed for soldering small temperature-sensitive parts without transferring much heat to the part itself.

Important Note on using flux: Be VERY careful about your choice of any extra flux. You really don't need to use any, but if you do choose to do so make sure that you use a liquid "no-clean" type of flux such as Kester 951. DO NOT use any kind of rosin or similar organic flux, it is almost certainly going to be incompatible with the flux in the no-clean solder and make a big mess. Extra flux may require excessive heat in order to boil off the flux, possibly damaging the sensitive components in the kit.

For soldering components on a board like the Remote Switch, we recommend a small pencil soldering iron, about 15W. If you are only going to use it occasionally, Weller makes a decent cheap 12W iron, it's about $15. There is also a similar iron that's sold by ECG. We like those, but the copper tips seem to oxidize and corrode rather quickly compared to some more expensive irons; fortunately, the tips are replaceable and cheap. Better would be a fancier soldering pencil with iron tips; those run about $30, but they'll last forever. The best iron would be a temperature-controlled solder station; they typically start at about $50 for a cheap one and can go to a few hundred dollars if you want to get really fancy. Weller makes a good one for about $50, if you make the investment that will probably be the last soldering iron you will ever need to buy. These solder stations usually have a little well with a tip-cleaning sponge, so they end up taking less room on your workstation too. Get the smallest tip you can find, preferably with a conical tip that's about the same width as the smallest pad. .032" (.8 mm) conical tip is ideal. We do NOT recommend that you use an extremely-fine "needle nose" tip, we have found that they may not conduct enough heat to the pads to allow the solder to flow out well.

General Assembly Information

We're sure that you are ready to get started, but before you do you will need to get some tools together. The tools that you will need are:

___ Low-wattage soldering iron, 15W or less, with a fine conical tip

___ Small needle-nose pliers

___ Small diagonal cutters

___ Tweezers to handle the SMT parts

___ A small damp sponge for cleaning the tip of your soldering iron

___ A lighted magnifier, for inspecting solder joints (not essential, but very helpful)

___ A jeweler's loupe or small 10x magnifier, for inspecting the SMT solder joints (again, not essential but VERY helpful)

___ A well-lighted place to work, preferably with a wood or metal surface, also preferably not carpeted

___ Some PAPER masking tape (do NOT use Scotch® tape or electrical tape)

___ Some ½" wide double-stick foam tape ("servo tape")

Each installation step has a check-off line, we strongly recommend that you check them off as you go, and that you perform the steps in sequence. We have listed the steps in order to make it easiest to assemble the Remote Switch, deviating from them isn't going to make your life any easier.

We strongly recommend that you consult the assembly pictures on the Eggtimer Rocketry web site, www.EggtimerRocketry.com . Go to Photos/Remote Switch Build.

Each step is pictured, so you can see exactly what you need to be soldering. Looking at the pictures as you go will help prevent you from soldering the wrong thing, or putting something in the wrong way.

Assembling your Remote Switch

Step 1: Sort the Components

Before you start soldering anything, you need to lay everything out and make sure that you are familiar with all of components, and that you have everything. If you are missing something, let us know immediately so we can send you whatever you need. You should have the following parts, check them off as you sort them…

	Qty	Description
__	1	Circuit board
__	1	PT2272-M4 Receiver board
__	1	Atmel ATTINY84A-SU Processor (SOIC-14 package)
__	1	LD1117-50 5V voltage regulator (SOT-223 package)
__	1	SI2302 MOSFET (SOT-23 package, very small with 3 leads)
__	1	3mm Red LED
__	1	3mm Amber LED (may be clear)
__	1	2.2K 0805 resistors (marked “222”)
__	1	4.7K 0805 resistor (marked “472”)
__	2	10K 0805 resistors (marked “103”)
__	1	.1 uF 0805 ceramic multilayer capacitor (brown)
__	2	10 uF 1206 ceramic multilayer capacitors
__	1	12mm Round Buzzer
__	1	4-position screw terminal block
__	1	Coil of .020” 63/37 No-Clean solder wire

Note that some of the components are static sensitive, so you should avoid sources of static electricity while you are handling them. We recommend that you assemble the Remote Switch on a wood or metal surface unless you are fortunate enough to have a high-temperature anti-static mat (don't buy one just to build the Remote Switch, however!) Avoid putting it on plastic surfaces that generate static, and preferably put it together in a room that's not carpeted. That being said, it's very unlikely that you will zap any of the components in the Remote Switch with static electricity, but consider yourself notified of the possibility…

Also note that some of the components are polarized, i.e. it matters which way you put them in. If you solder one of these components in backwards, the effect will range from something not lighting up (LEDs) to nothing at all working. It is CRITICAL that you test-fit the parts before you solder, and that you make ***SURE*** that you have them pointed the right direction before soldering. Like the old adage says, "Measure twice, cut once." If you solder a part onto the board incorrectly, it can be a minor pain to remove if it only has two pins, or it can be virtually impossible for something with a lot of pins. ***The Remote Switch Limited Warranty does not cover incorrect assembly***, so if you mess up badly enough you may end up having to get another kit and starting over; neither of us want that.

It is very important that you assemble the Remote Switch in the order listed. This makes it easier to access the surface-mount components; if you start soldering out of order it's going to be tough for you to get to the pads of the SMT parts. Some of the instructions will call for you to tack-tape parts to the board to maintain alignment while you solder. You should ONLY use paper masking tape for that purpose, DO NOT use "Scotch"® tape or electrical tape for this; plastic tapes can pick up static electricity and damage parts, and electrical tape tends to leave a sticky residue.

If you have any questions about the assembly, please send us an email, to support@eggtimerrocketry.com , BEFORE you start building. We generally answer all questions the same day, and we do our best to ensure your success.

Eggtimer Remote Switch Assembly Checklist

Before you solder anything, make ***absolutely*** sure that you have the correct part and that it is inserted in the board correctly. The board has all of the component values, outlines, and polarities silk-screened on the top, so there shouldn't be any doubt about what goes where and how. Nevertheless, if you have any questions about the assembly procedure, do not hesitate to drop us a line at support@eggtimerrocketry.com before you solder the parts to the board. You may have to wait a day for the answer, but it could save you a lot of grief later on!

The Remote Switch Limited Warranty does not cover damage to parts while attempting to desolder them because you inserted something incorrectly. We spent a lot of time making sure that the assembly instructions were clear, but once again if you have any questions about the assembly procedures drop us a line at support@eggtimerrockety.com ***before*** you solder.

OK, so let's get started…

__ Mount the ATTINY84A-SU Processor

Carefully remove the processor chip from the baggie in which it was shipped. Identify the notch or "bar" at one end of the chip, this end needs to line up with the notch that's silkscreened on the PC board.

Tape the PC board down to your work surface with some masking tape. Lightly "tin" ONLY the bottom-right pad of the 14 processor pads. Hold the processor in place with some tweezers, set it down on the PC board, and heat up the lead over the tinned pad until the solder melts onto the lead.

With a 10x jeweler's loupe, inspect the alignment of the leads over the pads to make sure that they are centered. If they are not, carefully heat up the solder joint and move the processor as necessary to get them centered. Once you are satisfied that the leads are all lined up with the pads, solder the remaining pads one by one, using as little solder as possible, and alternating sides and pins to prevent overheating the processor. Wait 15 seconds between solder joints to allow the processor to cool down.

When you are done, inspect the solder joints again, making sure that there are no solder bridges or incomplete joints.

__ Mount the .1uF capacitor

Locate the spot for the .1 uF capacitor, just below the notch on the processor. The .1 uF capacitor is the small brown part with no markings. Note that there are other capacitors in the kit, but the .1 uF is a bit smaller. Lightly tin only ONE of the two pads on the board. With tweezers, lay the capacitor down on the board, and heat up the lead over the tinned pad until the solder flows. Wait a few more seconds, then remove the heat, holding the capacitor there until the solder cools for about 5 seconds. Let it cool for another 15 seconds, then carefully

solder the other pad, being careful not to use too much heat (or you'll lift the part off the board!).

__ Mount the 5.0V Voltage Regulator

Locate the large pad and the three small pads for the voltage regulator. Heat up the pad with your soldering iron and melt a small amount of solder on the large pad, just enough to cover it. Place the voltage regulator IC in place, and hold it down, then heat up the large pad on the voltage regulator until the solder starts to flow. Hold your soldering iron on the pad for another 5 seconds, then remove it and wait at least 10 seconds.

One by one, solder the three small three small leads to the pads, using enough solder to cover the pad and get a good "tenting" on the leads without creating solder "blobs". Wait at least 30 seconds between each pad to prevent the chip from overheating.

__ Mount the 10K resistors

Locate the 10K resistor (marked "103") just below the processor. Solder it in place, using the same procedure that you used for the .1 uF capacitor.

Locate the second 10K resistor, next to the voltage regulator. Tin ONLY the lead closest to the voltage regulator. Place the resistor over the pads, and heat up the tinned pad. DO NOT solder the other pad at this time… you'll see why in the next step.

__ Mount the MOSFET

Locate the spot for the MOSFET, it's just to the right and below the voltage regulator. Very carefully remove the MOSFET from its package, you'll notice that the pads on the PC board are much wider than the lead spacing. This is done to make it easier to solder in place, and the extra copper and solder provides heat sinking for it.

Lightly tin the ONE pad nearest to the right side of the board. With tweezers, hold the MOSFET in place, centering it over the pad. If you have it right, the two leads on the other side should just sit on the inside edges of the opposite pads. Heat up the lead over the tinned pad until the solder starts to flow onto the lead, wait a few more seconds, then remove the iron and let it cool for at least 5 seconds before you let it go.

Inspect the alignment of the MOSFET, making sure that the other two leads are sitting on their pads. Once you are satisfied, solder the leads to the pads. The top pad is right next to the 10K resistor that you previously mounted, add enough solder so that it solders that resistor too. One pad, two components…

__ Mount the 2.2K resistor

Locate the 2.2K resistor (marked “222”) just below to the left of the processor. Solder it in place, using the same procedure that you used for the .1 uF capacitor.

__ Mount the 4.7K resistor

Locate the 4.7K resistor (marked “472”) below and to the right of the processor. Solder it in place, using the same procedure that you used for the .1 uF capacitor.

__ Mount the 10 uF capacitors

Locate the two 10 uF capacitors, one just above and one just below the voltage regulator. Note that they are a bit larger than the other resistors and capacitors. Solder them in place.

This completes the surface-mount part of the assembly. Untape the board from your work surface. At this point, you may find that a “third hands” board holder will come in handy…

__ Mount the Red LED

Locate the spot for the Red LED, it’s the one on the bottom right hand side of the board marked “ON”. Note that it is polarized; you need to match up the LONG lead on the LED with the “+” pad on the board. Insert in in place, and use a small piece of paper tape to hold it to the board. Turn the board over, solder the leads to the pads, and clip the excess leads. Save the clipped leads… you’ll need them later.

__ Mount the Amber LED

Locate the spot for the Amber LED, it’s the one marked “BTN” on the lower left side of the board. Note that it is polarized; you need to match up the LONG lead on the LED with the “+” pad on the board. Insert in in place, and use a small piece of paper tape to hold it to the board. Turn the board over, solder the leads to the pads, and clip the excess leads. Save the clipped leads.

__ Mount the Buzzer

Locate the spot for the buzzer. Note that it IS polarized, the long lead needs to go into the hole marked “+”. Insert the leads into the holes, and hold it in place with a small piece of paper masking tape. . Turn the board over, solder the leads to the pads, and clip the excess leads.

__ Solder the Screw Terminal Block (Optional)

If you're going to use it, insert the screw terminal block on the board, making sure that the open side is facing outwards (to the right). Turn the board over and solder the pins to the pads.

Get out your lighted magnifier and carefully inspect all of the solder joints. Make sure that there are no solder bridges, particularly on the processor and the "0805" sized parts. If something doesn't look 100% right, resolder it, removing it first if you have to.

Preliminary Testing

At this point you have soldered everything except the receiver module… time for some preliminary testing. DO NOT SKIP THIS STEP! Once you mount the receiver module, you will have a very difficult time getting to the components if something doesn't work.

Loosen the screws on the terminal block, and connect your battery "pigtail" to the leads marked IN. If you're not using the terminal block, solder your battery pigtails to the pads marked IN. Make sure that the "+" lead (generally RED) goes to the "+" terminal on the terminal block, and the "-" lead (generally BLACK) goes to the "-" terminal. If you are not 100% sure of the colors and polarity of your battery pigtail, check them with a digital voltmeter and your battery BEFORE you connect it. Tighten the screws (if you used the terminal block).

Connect your battery to the pigtail. You should hear a loud beep lasting for about 2 seconds, then it should stop. If you wait another 15 seconds, you should hear a very short beep. This means that the processor, power supply, and buzzer are all working, and you can go on from here.

If you do NOT get a beep, then you have a solder bridge, short, or forgot a solder joint, or you installed a part backwards. Go back and carefully inspect every joint and confirm that the parts are all installed correctly.

Mounting the Receiver Module

The PT2272 receiver module comes with a right-angle header pre-soldered to it. If we were going to mount it at a right angle to the board this would be ideal, however we're not so we need to get rid of the header. This isn't nearly as hard as it sounds, but you do need to be careful when you heat up the solder joints that you don't overheat the pads and lift them off the board, or underheat them and accidentally pull them off.

__ With a pair of small diagonal cutters, carefully clip the plastic header carrier between each pin. Inspect the cuts carefully with a magnifier to make sure that the cuts go clear through, otherwise it will be difficult to remove the pins in the next step.

__ Turn the board over so that the header pins are facing downward, and heat up one of the header pins from the bottom. When the solder melts, gently push the pin through the hole with the tip of your soldering iron while keeping the solder molten. If you clipped the plastic

header carrier all the way through, the pin should simply fall out of the hole as you melt the solder. You may have to wiggle the board a bit to get it to fall out. If it doesn't check the cut on your carrier again.

__ Similarly, remove the other header pins.

__ With some solder wick, clean up the holes so that you can see through them. They don't have to be completely clear because the wire you're going to be soldering through them is much smaller than the hole, but make sure they're not blocked.

__ Cut a piece of ½" wide double-sided foam tape about 1 ½" long. Put it on the bottom of the receiver module, about ¼" below the row of holes that you just cleared. Remove the backing on the other side of the tape.

__ Hold the RF module so that the 7 holes that you just cleared are just above the 7 matching holes on the top of the Eggtimer Remote Switch's PC board. Don't press it down yet. Take one of the clipped wires from the LED's and put it through the top of the hole marked "GND", and push it down so that it goes through the Remote Switch PC board's GND hole. Similarly, put another wire clipping through the opposite hole (marked "VT") and through the PC board. Gently push the RF module down over the Remote Switch board so that the tape sticks, keeping the holes in alignment as much as possible.

__ Inspect the wire leads to make sure that they're going through the Remote Switch's PC board. When you're satisfied, solder the wires to the TOP of the RF module, and clip them off. Save the clippings…

__ Turn the assembly over and solder the two wires to the BOTTOM of the Remote Switch PC board. Clip off any excess lead (there shouldn't be much).

__ Turn it back upright, and in a similar manner install wires in the other 5 pads, using clippings from the LED's leads.

You are now done! Time for a little final testing…

Final Testing

__ Connect your battery to the pigtail that you mounted earlier. You should hear the same beep that you heard before, and if you wait 15 seconds or so you should hear the short beep again.

__ Press each button of the remote. As you press the buttons, the amber BTN LED should light up, and you should hear a short blip from the buzzer.

__ Unplug the battery, wait a few seconds, then plug it in again. After the long beep has stopped, press D D D D D D D D (yes, that's 8 "D's"). You should hear three short beeps,

this lets you know that it's in programming mode. Press A B C D A B C D, you should then hear three beeps again to let you know that the code "took".

__ Wait about 10 seconds, then press A B C D A B C D. You should hear three beeps, then the red "ON" LED should come on. This confirms that the switch is working. Wait about 10 seconds, then press A B C D A B C D again. You should hear TWO beeps to let you know that it's turning off, and the red "ON" LED should turn off.

At this point, congratulations! You're done. Read on for a detailed explanation of how to hook it up to your electronics and how to use it. If you're a bit impatient and want the 10-second tutorial, jump to the Quick Reference Guide at the end of this manual… if you get stuck, though, you just might end up reading the long version anyway!

If you do NOT get the right beeps and lights, you have some work to do. You'll have to GENTLY bend the RF module board away from the Remote Switch PC board, and check the solder joints on components. Pay close attention to the components that have the smallest clearance, they are most likely to be the ones causing problem.

Using Your Remote Switch

Mounting the Remote Switch in Your AV Bay

The Remote Switch has two #4 holes for mounting in a AV bay sled. It's about 2.5" x .9", so you'll need to make sure that you have enough room on your sled for it. It doesn't matter which way you mount it, as long as it's mounted so the circuit-side is facing outwards. There's a drilling template on the Eggtimer Rocketry web site, we recommend that you download it, print it, and cut it out with scissors so you can drill the mounting holes accurately.

Our favorite mounting method is to use two #4 hex-head cap screws, about 3/4" long, and a short (about 1/8") piece of ¼" i.d. rubber tubing to act as a spacer between the bottom of the PC board and the sled. We hold it on with nylon-insert nuts… they don't work loose. If you mount it like this, you can pretty much use whatever monster motor you may have on-hand (like the infamous O5800, for example) without fear of anything coming loose.

For rockets with somewhat lesser acceleration, we've used double-stick foam tape ("servo tape"), it works just fine. Be sure to cover the bottom completely, and make sure that whatever surface you're attaching it to is nice and clean; any dirt will get between the adhesive and the board, and keep it from sticking.

We generally recommend that you try to mount the Remote Switch as close to the battery and your altimeter as possible, and keep the wiring as short as possible. Small zip ties work really well for tidying up the wires. Also, we **strongly** recommend that you zip tie the wires connected to the Remote Switch to your sled, to provide strain relief for them. In general, if a wire can't move, it won't come loose. Enough said…

Connecting To Your Electronics

The Eggtimer Remote Switch is designed for a battery from 6V-20V, this fits in nicely with the requirements of most hobby rocketry electronics (which typically use a 9V alkaline battery or a 2S/7.4V LiPo battery). Since the Remote Switch is designed to be used with a variety of different batteries, we don't provide a battery connector; you'll need to get whatever connector matches the battery that you're using. Note that the Eggtimer Remote Switch can NOT be used with an altimeter that uses a 1S/3.7V LiPo battery; the Remote Switch's RF module runs on 5V, and 3.7V just isn't enough. Fortunately, almost all of them out there use 9V or 2S/7.4V batteries.

Loosen the screws on the INPUT side of the screw terminal block, and connect your battery connector to it. Usually, the "+" side of the battery will be RED and the "-" side will be BLACK; if you are not 100% sure, use a DVM to confirm the polarity BEFORE you connect a battery. Tighten the screws firmly. If you are using stranded wire, you may want to tin just the very end of the wire to prevent it from fraying; a loose strand of wire can short out the battery, which can cause a fire if you're using LiPo batteries, so check your connections carefully to make sure that there are no shorts.

You will be hooking up your electronics to the OUT side of the Remote Swtich. The Remote Switch basically replaces the battery input on your altimeter, which is why you want to be using the same battery that you'd be using for your altimeter. Connect the "+" side of the OUT terminal to the "+" battery input on your altimeter, and the "-" side of the OUT terminal to the "-" battery input on your altimeter.

Since the Altimeter is going to be switched on and off by the Remote Switch, you will need to shunt any separate switch input that your altimeter may have. Generally, all you need to do is to connect a short piece of wire between the two switch terminals. When you turn on (and off) your Remote Switch, it will then power on (or off) your electronics.

Getting to Know Your Remote Switch

Once you have the battery connector installed, hook up your battery. The buzzer should sound for about one second, and you should immediately see a RED light on the PT2272 receiver module. If you do not, disconnect the battery and check your connections. If they look OK, go to the Troubleshooting section for further assistance.

Now, try pressing the buttons on your remote. As you press each button, the amber BTN light should flash, and you should hear a "chirp" from the buzzer than acknowledges that your button press was received. Go through the buttons to make sure that they all work.

Let it sit for awhile… after about 30 seconds, you'll hear a single "chirp". This lets you know that the battery is connected, but the switch is OFF. We do this because you're not going to be able to see the LED's once the Remote Switch is buttoned up in your AV bay, so the audible indication tells you about the switch's status. Since the Remote Switch uses a small amount of power from the battery even when it's "OFF" (about 15 mA), you'll want to know if the battery is connected; you don't want to leave connected for a week after your flight and accidentally run down your battery!

Now we're going to change the code, since the default code "DDDDDDDD" is not a valid code. (It's the "program me" instruction). Disconnect the battery, wait a few seconds, then reconnect the battery. After the long beep, press the "D" button 8 times… the beeper should beep 3 times to confirm that you are now in programming mode. Note that you can only go into programming mode immediately after power-up; you have 20 seconds to press "DDDDDDDD". After that, if you enter the D's you'll just get a long beep to let you know that it's an invalid command.

Once you're in programming mode, press any combination of 8 buttons (however they cannot all be the same button…) to set the new combination. After the last button press, the buzzer should beep 3 times to confirm that the code has been accepted. The code gets saved into non-volatile memory, so it will be "remembered" until you change it again, even after you disconnect the battery. Note that if you wait more than 5 seconds between a button press it will abort the programming process, and give you a long beep to let you know that this has happened. You'll have to disconnect/reconnect the battery to put it back into programming mode.

Now we're going to confirm that the code that was saved was the same code that you entered. Wait about 10 seconds, then press the "A" button 8 times. There should be a short pause, then you should hear the buzzer beep out a count 8 times. This tells you what the programmed code is… 1 count = A, 2 counts = B, 3 counts = C, 4 counts = D. For example, for the code "ABCDABCD" you would hear:

1 beep <pause>
2 beeps <pause>
3 beeps <pause>
4 beeps <pause>
1 beep <pause>
2 beeps <pause>
3 beeps <pause>
4 beeps <pause>

Once you've confirmed that the code "took", you can try turning the Remote Switch on and off. Enter the code that you programmed, after the last (8^{th}) button press you should hear 3 beeps, and the red ON light should turn on. If you have some electronics connected to the OUT terminals, that should come on as well. If you get a long beep and the ON light doesn't come on, that means that either the code was entered incorrectly or you waited too long between button presses… wait a few more seconds then re-enter the code.

Now, just sit back for a bit and admire your handiwork… after about 30 seconds, you'll hear it chirp to let you know that it's on, but this time it will chirp 3 times instead of just once. This tells you audibly that it's "ON"… the audible indication could be very important once your AV bay is closed!

To turn the Remote Switch "OFF", enter the code that you programmed. You should hear TWO beeps to let you know that it's turning OFF, and the "ON" light should turn off. Your electronics should also shut off.

A Special Note About Remotes

The Eggtimer Remote Switch uses the Princeton Technologies PT2272 decoder, so the transmitter needs to use its peer, the PT2262. We don't sell the remotes, because they're a generic item that you can get cheap on eBay, way cheaper than we can sell them to you. Just go on eBay or Amazon and look up "315 MHz 4-button RF remote"… you'll see tons of them, usually for under $5. Make sure they're on 315 MHz, not 433 MHz. You'll see that they all pretty much look the same…

We HAVE seen some PT2262-based remotes that work a little differently, in particular there's one from Adafruit that has the buttons reversed. (i.e. "A" is actually "D", B is C, C is B, and D is A). It's too bad because it's a really nice looking remote, and we really like the stuff that Adafruit sells (we use some of their stuff in-house). You CAN use it, you just have to reverse the button assignments, so programming is "AAAAAAAA" and the code beep-out is "DDDDDDDDD" for example, and the verification beep-outs are reversed too.

Troubleshooting

If your Eggtimer Remote Switch doesn't work after assembly and testing, take a deep breath, get out a beverage to clear you mind, and start troubleshooting…

Check Your Solder Joints

The very first thing you should do is to check out all of the solder joints under a lighted magnifier, or with a 10x jeweler's loupe or magnifier. The most common reason for things not working are solder bridges, i.e. putting too much solder on the pads and shorting two adjacent pads together. You can also get into problems by bridging pads with "vias" on the board, the smaller holes that don't have any components soldered to them. Most of the holes and the pads are very small, so it doesn't take much solder to get a nice "tented" solder joint. If you get a solder bridge, heat it up and use a solder wick or a vacuum bulb to remove the excess; afterwards, we recommend resoldering the joints. Note: NEVER use "canned air" or compressed air to "blow away" excess solder. The resulting solder splatter will almost always cause more damage than the original solder bridge.

Another thing to look out for is "cold" solder joints, they look dull and blobby compared to a nice shiny "tented" solder joint. Cold solder joints won't conduct well; at the low power that the Remote Switch uses this could easily keep things from working. If you have a cold solder joint, heat it up and put just a little bit of solder on it, the main idea is to get a little more flux on the joint. If there's too much solder, use a fine solder wick or (preferably) a vacuum bulb to remove the excess, then heat it up and resolder the joint.

Check Your Component Polarity

Most of the components aren't polarized, with some notable exceptions. The outline of the parts is silk-screened on the board, so you should be able to see readily if you have a component soldered in backwards. Some of the components are not symmetrical (i.e. the voltage regulators) so they would be difficult to install backwards, too. Components that are polarized AND symmetrical are:

- The processor. Whatever you do, DO NOT install this component backwards… it will be virtually impossible to remove and you will almost certainly damage the board trying to do so.

- The LEDs, the side with the long lead should be inserted into the holes marked "+". Unfortunately, once you've soldered them in and clipped the leads it will be difficult to tell, so make sure you get it right the first time.

If you inserted a component incorrectly, you will have to carefully unsolder it, clear any solder residue from the holes, and resolder it. If you find that a component was soldered incorrectly, you will have to use a vacuum bulb or vacuum desoldering tool to unsolder it. We cannot

stress enough that you need to check the orientation of the parts ***before*** you solder them. The Eggtimer Remote Switch Limited Warranty does not cover damage to a component while attempting to unsolder it, so make take your time and make sure you get it right before you solder.

If It Still Doesn't Work…

There is, of course, always an outside chance that you have a bad component. We test each processor and the PT2272 receiver module, and the other parts are factory-direct so the likelihood that one of them is bad is very small. Nevertheless, it is always possible that something may be wrong; there may be a bridge on the PC board itself, etc. If you have gone through all of the troubleshooting steps and the board still doesn't work, let us know at support@eggtimerrocketry.com . A high-resolution picture (5 megapixel or better) of both sides of your circuit board and a description of the problem would be very helpful…

Troubleshooting Tips (in approximate order of likelihood)

No power-on beep and/or no receiver module power LED

- Battery cable connected incorrectly

(Match "+" and "-" on the INPUT side with your battery connector)

- Bad solder joint on voltage regulator
- Bad solder joint on 10 uF capacitors
- Bad solder joint on the processor
- Buzzer mounted backwards (long lead needs to be on the "+" side)

BTN Light doesn't flash when I press a button on the remote

- Bad solder joint on the 2.2K resistor next to the LED
- Bad solder joint on the LED, or LED reversed
- Bad solder joint on the receiver module pads
- Solder bridge on the receiver module pads

Button press not recognized or no "click" when I hit a button

- Bad solder joint on the processor
- Bad solder joint on the receiver module pads
- Buzzer mounted backwards (long lead needs to be on the "+" side)

Switch won't turn on when I enter the code

- Bad solder joint on the "ON" LED or LED reversed
- Bad solder joint on 4.7K resistor next to the ON LED
- Bad solder joint on the processor
- Bad solder joint on the MOSFET
- Bad solder joint on the 10K resistor next to the MOSFET

Eggtimer Remote Switch Quick Reference Guide

To Turn ON: Enter the programmed code, buzzer will beep 3 times

To Turn OFF: Enter the programmed code, buzzer will beep 2 times

To Program: Enter Eight D's right after power-up, then enter an 8-button code

To Verify the Code: Enter Eight A's, it will beep out the code as follows:

1 beep = A
2 beeps = B
3 beeps = C
4 beeps = D

Idle Chirps:

1 Chirp: Switch is "OFF"
3 Chirps: Switch is "ON"

Specifications:

Input: 6V-20V

Output: Same as input, 2.8A max. continuous, 8A peak

Radio: 315 MHz, ASK

Decoder: Princeton Technology PT2272

Range: Approx. 30'; up to 100' using an additional antenna

Security: Over 65,000 possible combinations

Extending the Range with an External Antenna

The PT2272 RF module has a built-in PC loop antenna with a range of around 30'. For most purposes, this range works just fine; you'll probably stop hearing the buzzer before you run out of range.

However, if you're using it in a carbon fiber (CF) rocket, you may not get the range you want, since CF is conductive and attenuates radio signals. If you find that you can't get it to work inside your CF AV bay, you may want to install an additional antenna.

There are two types of antennas that you can make that will work. The first is a simple wire whip antenna, basically you simply cut a 9 3/8" piece of 24 gage solid insulated hookup wire and solder one end to the antenna input (which is the empty round pad marked "ANT" on the corner of the RF module right next to the red "ON" LED). This works OK, but you'll need to find a way to keep the wire from kinking or otherwise distorting or it won't be as effective. Depending on the layout of your AV bay and the size of the rocket, this may be easy, or it may be dang near impossible.

The other type of antenna, and the one that we recommend, is a helical antenna. Take the same 9 3/8" piece of 24 ga. solid wire and wrap it around a round form about ¼" in diameter, spacing the coils one wire-width apart. A piece of 3/16" paper launch lug works very well for this. Solder one end to the aforementioned antenna input on the RF module, and secure the antenna so it can't move around. A little paper masking tape works fine, and it's OK if you leave the launch lug in the middle to help keep the coils in position. You can almost always find a place to mount the helical antenna, since it uses up a whole lot less room than a wire whip antenna.

Eggtimer Remote Switch Limited Warranty

Eggtimer Rocketry warrants that all of the parts listed in the parts list necessary to build the Eggtimer Remote Switch are included in the kit, and that they are all new and working. We don't use surplus parts… we like stuff that we know will work. If you open up the package and find that something is missing, send us an email to support@eggtimerrocketry.com letting us know, and we'll get it taken care of right away.

Eggtimer Rocketry warrants that when constructed per the documented assembly procedure the Eggtimer Remote Switch will perform substantially per the instructions. We try very hard to make sure that our stuff works the way we say it does, but because software isn't perfect we can't always anticipate things that may occur. If we find that there is a problem that prevents the Remote Switch from operating as documented, we'll do our best to fix it in a timely manner.

Since there is a wide variation of possible configurations using the Eggtimer Remote Switch and there is no way that we could possibly test them all, we do not warrant the suitability of the Eggtimer Remote Switch for any particular purpose. Hobby Rocketry is just that…a hobby. It's up to you to decide how to use our products, and whether or not they are suitable for your projects.